

11 production sites: 1 Quality Management system

A unique first for DSM Composite Resins

Introducing a single Quality Management System across each of our eleven production sites has been a unique achievement in the composite resins sector. In the spirit of Total Quality Management (TQM), the new system is certified according to the International Standard ISO 9001:2000. Substantial investment and organisational commitment have meant that the former situation whereby each site had its own quality procedures, has now

been replaced by a single Quality Management system, founded on the shared best practices operated from each location.

'Our organizational structures now reflect our international position', said Business Group Director Dimitri de Vreeze Business Director, Structural Resins, which is especially important in our business as structural resins are very logistically demanding in terms of their production, storage and transportation complexities.'



40 years of corrosion protection against seawater

The main theme of this issue is the long-term resistance of FRP structures against salt-water attack.

The exceptional corrosion resistance properties of unsaturated polyester (UP) and vinyl ester (VE) resins were quickly recognized as far back as the early 1960s. Ever since then these versatile materials have been used for containers,

tanks and pipes used in the storage and transportation of many different types of chemicals including organic and inorganic acids, alkaline solutions and organic components. These resins are also used in contact with salt-water solutions - one of the most corrosive media.

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New Tanks, Pipes and Relining Industry Newsletter

Welcome to this, the first issue of Solutions Tanks, Pipes and Relining - the brand new customer newsletter from DSM Composite Resins, dedicated to the chemical resistance sector. The newsletter replaces our TopNews, which has successfully run for four years. We will be maintaining the same popular mix of articles but in a new format published twice a year.

As one of Europe's leading producers of chemically resistant resins, we are supporting this core segment with focused communications. The newsletter will include the latest information on new applications, products and processes, customer cases and industry news. If you want further information on any of the items mentioned, please contact your local sales office.

Dimitri de Vreeze
Business Director, DSM Composite Resins, Structural Resins Europe

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Although UP and VE resins contain ester groups, potentially a weak link in the polymer backbone, the hydrolytic stability of these chemical groups is so good that cured resins easily withstand exposure to water or saline solutions for many decades without loss of performance.

Depending on the chemical backbone, resin types can be selected for exposure at different pH levels and elevated temperatures. In contrast structural materials such as metals, are not suited to humid environments due to their sensitivity to oxidation (rust formation).

For more than 25 years, UP resins have been recognized as the ideal material to renovate defective or damaged sewer pipelines by using a special, in-situ renovation technique known as relining or cured-in-place-pipe (CIPP). The end product, which is essentially a pipe within a pipe, may be produced by a completely different application technique, but nevertheless shows a lot of similarity with GRP pipes produced by filament winding or centrifugal casting - including the chemical resistance and hydrolysis resistance demands. It is therefore logical to combine these end-use segments (Tanks, Pipes and Relining) in a single magazine.

GRP Gratings



Oosterscheldedam

Synolite gratings for Oosterscheldedam

The Oosterscheldedam, which forms the final part of the immense Dutch waterworks called the Deltaplan, protecting the Dutch province of Zeeland from North Sea flooding, is a well-known landmark and technical masterpiece.

The massive Delta Works took nearly 30 years to complete. Of all of the dams, the Oosterscheldedam is the most impressive. The flood barrier stretches along almost three kilometres and consists of 65 pillars between which 62 steel floodgates operate. When the sea becomes dangerous it takes just one hour to lower the gates.

Being situated at the end of a former estuary of the Schelde River, the Oosterscheldedam is continuously attacked by the combined effects of seawater and UV radiation. Continuous and intensive maintenance is therefore routine business for the civil authority operating the dam.

For maintenance and access reasons, there are many steel stairways and platforms along the dam's 6 km. length. The steelwork is painted and the walkways and stairways are made of hot-dip galvanised grating. Due to the severely corrosive

conditions, the steel has had to be repainted several times and the gratings have been re-galvanised over the last 20 years.

In the early 1990s, research carried out by Rijkswaterstaat, the ministry which controls the water quality of rivers, lakes and the sea, showed that seawater pollution was being caused by diffuse sources - migration of zinc from galvanised gratings into the seawater. In the search for a more suitable material, GRP was selected as the best alternative.

Fiberstruct b.v. located in Terneuzen, was awarded the order to deliver 4.000 m² of GRP grating and 2000 stair-tread sections. Fiberstruct developed a special type of grating and stair-tread for this large order, which met the severe demands of the authorities based upon the BM ISO 14.122 and the 15-metre ball test requirements.

As a long-term user of structural resins from DSM Composite Resins, Fiberstruct utilizes high quality Synolite isophthalic acid based UP resin for this application. This resin guaranteed the required chemical resistance, hydrolysis resistance and general weathering performance required in such a demanding environment.

Iso resins for excellent seawater resistance

It may seem to be benign, but water is a surprisingly aggressive medium. You only have to look at the corrosive effects that water, and saline environments in particular, have on metals, to appreciate the scale of a problem which costs the world's utility and process industries billions of dollars a year to replace and renovate tanks and pipework. Fortunately isophthalic acid based unsaturated polyester resins offer a much more resistant alternative to metals.

Resins are produced by a polycondensation reaction between glycols and diacids and/or anhydrides at high temperatures. In this reaction ester linkages are formed and water is removed, leaving a polymer backbone, which has to be dissolved in styrene to reach the final resin product. One of the main components of these types of resins is isophthalic acid.

Because polycondensation is an equilibrium reaction, the ester linkages can be broken again by hydrolysis when water comes into contact with the cured polyester resin. Ester groups are therefore the weak linkages in the polyester molecule. Fortunately the hydrolysis process is extremely slow at low temperature so products based on iso-resin can easily withstand the exposure to water for many decades without loss of mechanical performance.

One mechanism that does have a major

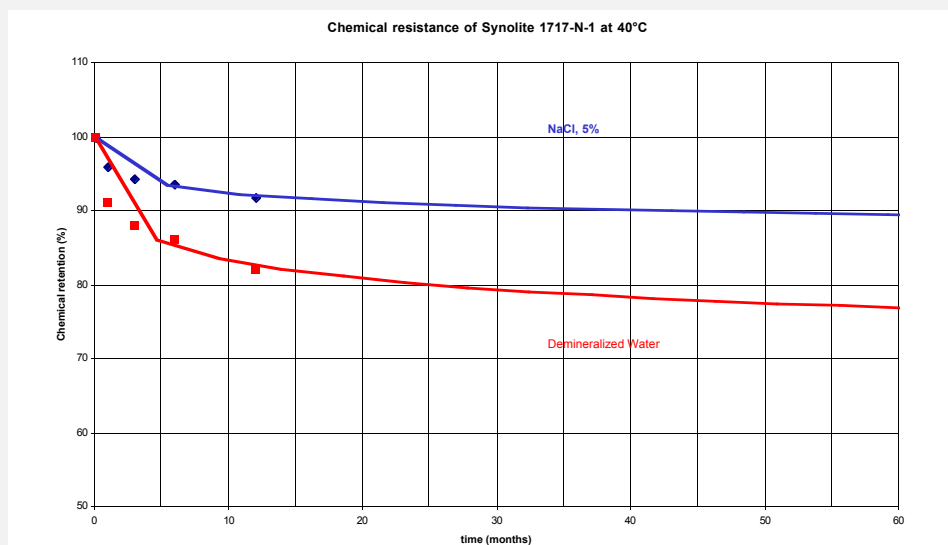


Many resins of DSM Composite Resins are used in offshore applications

impact on mechanical performance is osmosis. When water is absorbed by the laminate, it can come into contact with soluble material in the substrate – found, for instance, in small air pockets – which dissolves it. The result is

blistering and, in severe cases, de-lamination. Under fresh water conditions (distilled water or even high humidity), the reaction creates a concentration gradient across the laminate, which acts as a semi permeable membrane. Since the solute concentration in the dissolved part of the laminate is much higher than the solute concentration in the fresh water, osmotic pressure will cause water to be drawn through the laminate towards the concentrated solute. This reaction occurs because the water pressure and salt concentrations on either side of the membrane attempt to equilibrate.

However in seawater osmotic blistering is not normally a serious problem. That's because external water which is relatively high in dissolved salts, will not favour the formation of osmotic gradients. Chemical resistance test results (opposite) show the chemical retention of Synolite 1717-N-1 exposed at 40°C with demineralized water and 5 % NaCl solution.



Synolite 1717 on the Mediterranean seabed



Pressure test bending of the pipe and coupling

Because of its extremely good mechanical and corrosion resistance properties against sea water conditions, Synolite 1717-N-1 has been selected for a very special project:

In December 2002, Van Oord ACZ in Gorinchem awarded Platicon the production of 20 GRP couplings for the installation of an 11 km long HDPE sea outfall pipeline. The pipeline will be the longest sea outfall in Europe.

Van Oord ACZ is a globally operating marine, offshore and dredging contractor. They were awarded the contract in a joint venture with its French subsidiary Draflumar and two other French contractors. Van Oord ACZ is responsible for most activities including dredging the trench, installing and coupling of the pipelines and subsequently covering the pipeline with protective concrete mattresses.

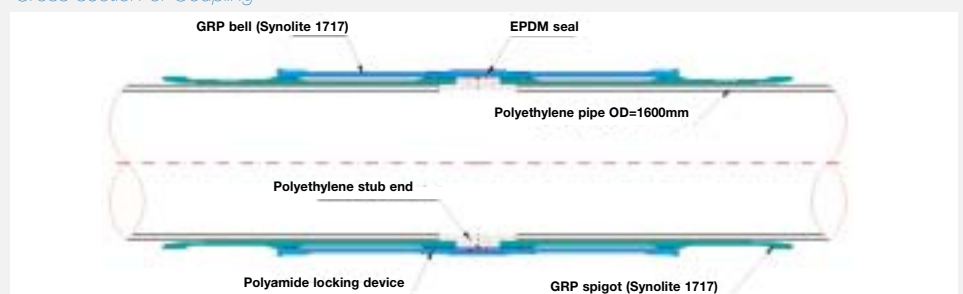
The project is well under way and, on completion, the outfall pipeline will be used to discharge treated sewage from the Montpellier agglomeration into the Mediterranean.

The pipeline consists of 20 sections of HDPE pipe with an outer diameter of 1600 mm and a wall thickness of 61 mm. Each pipe section has a length of approximately 550 meters with a stub-end at each end.

The Synolite 1717-N-1 based GRP couplings are used to join the pipe sections above water

level on the open sea. After each coupling is made, that section of pipe is immediately lowered to the seabed (a maximum depth of around 30 metres). During this process the pipe and coupling are heavily bent. The concept of the GRP coupling was developed by Van Oord ACZ in corporation with Solico, which subsequently carried out the design work. Solico, based in Oosterhout (NL), is an engineering company specializing in the development of FRP products. Solico designed the GRP couplings to withstand the forces during installation, and to provide maintenance and leak free couplings bet-

Cross section of Coupling





The bell section, filament wound in Synolite 1717-N-1

ween the HDPE pipe sections during its design life. High dimensional accuracy was critical because the result is a coupling that connects the pipe sections without using any metal parts.

The couplings were produced by Plasticscon the Netherlands, producer of GRP tanks, apparatus and piping systems, with production facilities in Oldenzaal (up to 4 m.dia) and Hengelo (from 4 to 10 m.dia). Plasticscon the Netherlands is a subsidiary of Plasticscon Europe, who also have production facilities in Germany, Poland, France and the UK.

Coupling configuration

Each coupling consists of three parts: one bell and two spigots and has a total installed length of 6500 mm. The wall thickness varies between 52 and 75 mm for the bell and between 44 and 78 mm for the spigot, equating to a total weight of 4400 kg.

Because the lifetime of the system has to be a minimum 50 years, a high quality isophthalic acid based UP resin Synolite 1717-N-1 was selected for this project. Total consumption for the project is 50 tons of resin.

Following an intensive and successful testing programme, production of the remaining 19 couplings began.

The bells, with five grooves on the inside, midway down the length, were produced in two runs. In the first step, the part in which the five grooves are situated, with a length of 1300 mm

and a thickness of 25 mm, was produced by filament winding on a separate mould.

In the second step, this prefabricated item was placed and aligned on the bell mould and the complete bell was filament wound. After removal from the mould, the 4 slot holes, needed for installing the polyamide cords, were drilled.

The outside trumpet shape of the spigots was hand laminated on a separate mould. By doing so, two spigots could be wound in one production step on a mould with a length of 6,5 meters. After cutting this item in two pieces, removal of the mould could take place. The outside grooves were machined on a lathe, and the machined surfaces were carefully top-coated. The various dimensions of the grooves had tolerances of about 0,3 mm; the distances between the grooves had a tolerance of 2,5 mm.

A production and dimension protocol was made for all parts, as requested in the contract. Also a final check of the assembled couplings took place in the Plasticscon works. Solico performed Quality Control of the couplings on behalf of Van Oord ACZ. The couplings were delivered according to the planning schedule and the construction of the pipework itself was successfully completed in November last year. The 3300 concrete mattresses are now being applied and the expected completion of the Mediterranean pipeline is February 2004.

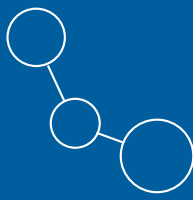
Coupling the pipe sections at sea



Resins for relining

The pipe relining market also demands high quality resins with optimal hydrolysis and chemical resistance, and long-term mechanical properties. Performance is critical since CIP-pipes have a life expectancy of 50 years or more and are produced on site under changing environments and conditions. Defects in the lining can be difficult to recognize and costly to repair.

With over 25 years experience in developing resins for this challenging application, DSM has an extensive range of dedicated UP-resins that includes standard iso resins and high hydrolysis-resistant NPG resins for civil sewers. Special corrosion resistant VE resins are available to renovate industrial waste systems; e.g. in the chemical industry. We offer resin grades dedicated both to the hot cure relining technique and UV-cure CIP-systems.



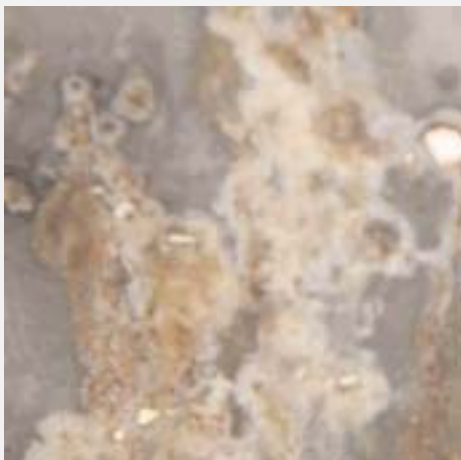
Atlac 580 pipeline withstands hot air and brackish water

NSGuassero / Verstedden have used Atlac 580 to filament wind 80 metres of pipe, in diameters of up to 1.5 metres, for renewing a hot air pipeline at a water treatment plant in the Netherlands.

The thermal sink air pipelines are integral to the RWZI bath, a sewage treatment process that uses the biological cleaning method, which is based on the fact that bacteria and air will degrade the dissolved material in the wastewater. The function of sewage treatment is to clean the wastewater as thoroughly as possible, so that the purged water does not harm the surface water. Atlac 580 has proved to be the ideal material for this demanding application. It is a bisphenol-A vinyl ester urethane resin that combines exceptional chemical resistance with an outstanding combination of heat resistance and flexibility. Atlac 580 withstands chemical attack from brackish water, and also gives a high level of thermal resistance. This property was especially important as the pipes in question transport hot air at 90°C into the waste water of the de-aeration tanks.

Previously the air pipelines had been made of zinc coated steel, but due to the influence of brackish water the old pipelines were completely corroded. A layer of zinc coating is commonly used to protect steel components,

Badly corroded former steel pipeline



Newly installed hot air pipeline

but since steel is more a base metal than zinc, the zinc layer will be sacrificed when exposed to very corrosive environments. When the zinc layer has been damaged in such a way, the steel will start to degrade as a redox-reaction. The rate of corrosion will increase when the steel-surface becomes exposed or when there is a high conductivity in the water. When corrosive components like

sodium chloride are dissolved in water, the conductivity increases - which is why corrosion in seawater occurs faster than in fresh water.

Thanks to the high performance of Atlac 580, the new hot air pipeline should last substantially longer than the previous system with minimal maintenance.



January 27 -28, 2004 London, UK	Flame retardants 2004	Info: The British Plastics Federation and Interscience Communications Tel: +44(0)20 86925050 E-Mail: intercomm@pipex.dial.com
February 16-18, 2004 New Orleans, Louisiana, USA	Molding 2004: Emerging Technologies in Plastics Injection	Info:Executive Conference Management Tel: +1 734 737 0507 E-mail: ECM@executive-conference.com
March 18, 2004 Würzburg, Germany	Schlauchliner Tag	web site: www.executive-conference.com Info: www.deutscher-schlauchlinertag.de
March 25-26, 2004 (New Date) Amsterdam, the Netherlands	Composite Profiles, Speed & Performance 7th EPTA Pultrusion World Congress, Amsterdam	Info: EPTA, PO Box 18, NL-3830 AA Leusden, The Netherlands Tel: +31-33-4343 500 Fax: +31-33-4343 501 E-mail: info@pultruders.com
March 30-31 and April 01, 2004 (New Date) Paris, France	JEC Composites Show Paris Expo	Info JEC Composites show: JEC SA, 4, rue Rembrandt F-75008 Paris Tel: +33.1.58.36.15.01 Fax: +33.1.58.36.15.15 Email: infojec@globalcomposites.com
April 20-22, 2004 Guildford, Surrey, UK	Advanced Polymer Composites for Structural Applications in Construction (ACIC 2004)	University of Surrey, Guildford Info: Mrs Penny Briggs Tel: +44 1483 686293 Email: p.briggs@surrey.ac.uk
April 23, 2004 Bromsgrove, UK	Composites in Processing 2004	Hanover Int. Hotel, Bromsgrove, UK Info: Composites Processing Associations, Sarum Lodge Tel: +44 (0)1443 228867 Email: info@composites-proc-assoc.co.uk
May 10 -11, 2004 UK	Euro Trade 2004 Exhibition Composites, Marine, Electronics, Engineering	Info: Heriot Spence Corporate Events Tel: +44 (0)845 600 1949 E-mail: eurotrade@heriotspence.co.uk
May 11-14, 2004 Hamburg, Germany	WindEnergie International Trade Fair	Info: WindEnergy, Heiko Heiden or Sandra Tobitzsch Tel: +49 4035692123 Email: info@windenergy-hamburg.de
May 16-20, 2004 Riga, Latvia	XIII International Conference on Mechanics of Composite Materials	Email: cirule@pmi.lv
May 25-27, 2004 Budapest, Hungary	Reinforced Plastics 2004 International Balaton Conference + Exhibition	Info: Association of the Manufactureres of Reinforced Plastic Materials C. Maros, PO Box 426, HU-1519 Budapest, E-mail: maroska@muki.hu. E-mail: bartajan@galatech.hu
May 31 and June 3, 2004 Rhodes, Greece	11th European Conference on Composite Materials (ECCM-11)	Info: A. Kosmatou Tel: +30 2610965266 E-mail: eccm11@iceht.forth.gr
28-29 September 2004 Baden-Baden	7th International AVK-TV Conference on Reinforced Plastics and Thermoset Moulding Compounds.	info: Ursula Zarbock tel: + 49 69 2509 22 e-mail: ursula.zarbock@avk-tv.de



News Round-Up



Profile

Kees den Besten,
Expertise Manager, Chemical Resistance &
Relining

Kees den Besten, 37, a graduate in Chemical Engineering, began his career with DSM 15 years ago and has been in his current position since January 2003. 'I have a very varied set of responsibilities which I really enjoy', said Kees, 'These include building up and distributing know-how on all aspects of chemical resistance. Then there is new product development which is an ongoing process normally carried out together with our customers. On a day to day level,

our department has to answer specific questions on chemical resistance and maintain our comprehensive database CRIS [chemical resistance information system]. We are also responsible for the recipe formulation and management for vinyl ester and relining resins – involving a close working partnership with the production site for these resins at Compiegne [France].'

Kees also looks after the technical marketing of these products, frequently giving lectures, authoring technical brochures and specification sheets and, of course, being on the editorial team for Solutions magazine.

Home life revolves around wife Elly and his young family, Tim (8), Thomas (5) and Emily (6 months). Kees enjoys sport in general and football in particular: being a long standing supporter of Feyenoord, his local team, and the team of his son Tim. He also runs three or four times a week, often during his lunch break and with some colleagues. So if you call Kees den Besten after lunch and he is out of breath – then you know why!

New vinyl ester bonding paste

Neogel BP 6100-W-1 bonding paste is a pre-accelerated toughened vinyl ester paste specially developed for the adhesion of laminates exposed to high dynamic loads across a broad range of temperatures. The adhesive paste exhibits an excellent chemical and hydrolysis resistance and is equipped with a low exotherm and peroxide indicator system. Standard MEKP-peroxide types can be used without the risk of gassing.

News archives available on line

Like TopNews before it, Global Solutions magazine is also available via our website www.dsmcompositeresins.com as a downloadable pdf file. You can also locate back-issues of TopNews in our archive library. Customers find this a useful resource when looking for articles or case studies that relate to their specific chemical resistance needs.

Resin manufacturers decide not to exhibit at JEC 2004

As you may have recently read in the trade press, DSM Composite Resins, and other UP resin manufacturers represented by the APME/CEFIC uPES group, have taken the decision to exhibit every second year at the

JEC Composites show in Paris. This means that we, together with other major players in the resin supply sector, will next participate in 2005. Although JEC is an excellent showcase, expenditure has to be prioritized in dif-

icult trading times. Composites is also a relatively mature industry where developments are evolutionary rather than revolutionary, so it is not essential for us to exhibit every year.

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